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AUTHOR Dougherty, Barbara J.

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ABSTRACT

This book introduces journal-writing prompts in mathematics for grades 3-4. Content prompts, attitudinal or affective prompts, and process prompts are presented. Each of the content prompts relates or connects topics within and outside of mathematics, targeting important or meaningful concepts and skills. The content prompts also provide situations that focus on areas in which students often have misunderstandings or misconceptions. Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. The responses to the process prompts can give insight into students' preferences for problem-solving strategies and how they learn or remember. (KHR)

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The "Write" Way

Mathematics Journal Prompts

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FOR GRADES 3–4

Barbara J. Dougherty

A Publication of the University of Hawai'i's Curriculum Research & Development Group

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1 of 35

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FOR GRADES 3–4

Barbara J. Dougherty

A Publication of the University of Hawai'i's
Curriculum Research & Development Group

Curriculum Research & Development Group Staff
Arthur R. King, Jr., Director
Barbara J. Dougherty, Director, The Hawai'i Algebra Learning Project
Edith K. Kleinjans, Managing Editor

Consultant: Fay Zenigami

Book and cover design:
Darrell Asato and Wayne Shishido

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Address all inquiries about the program to

The Hawai'i Algebra Learning Project
Curriculum Research & Development Group
University of Hawai'i
1776 University Avenue
Honolulu, Hawai'i 96822-2463

E-mail: crdg@hawaii.edu
On the Web: http://www.hawaii.edu/crdg/

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Using Writing in Your Classes

1. Share with students the rubric you are using.

2. Make copies of the rubric for students to keep in their notebooks and post one copy in the classroom.

3. Give students a practice prompt to write about. Allow about six minutes for them to respond. The practice prompt is usually an affective/attitudinal one. Regardless of the type you select, it should be one that all students can attempt.

4. Have students compare what they wrote with samples of other students' work that you provide. Or ask them to compare work with their partner or table mate.

5. Compare their work with the rubric. Have students focus on three things they could do to move their writing up a level. If their writing is already at the top level, ask them to write another question that this prompt made them think of.

6. Allow three minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

7. Collect the work.

8. For the first writing prompt to be done outside of class, assign a prompt that you think *all* students can write about.

9. When students return to class with their assignment, have them compare their writing with the rubric.

10. Allow two minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

11. Repeat this phase as often as needed to help students understand your expectations for their writing.

The "Write" Way: Mathematics Journal Prompts for Grades 3–4

The *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000) includes a separate standard for Communication for grades 3 through 5. This standard advocates using multiple activities that give students opportunities to demonstrate their understandings. These tasks should allow students to express themselves in a variety of ways such as with concrete models, pictures or drawings, or abstract symbols. Each of these forms lets students communicate with others about their thinking.

Communication should include at least five types of activities: (1) speaking, (2) reading, (3) listening, (4) modeling or constructing, and (5) writing. The last type can take the form of journal writing.

Journal writing can be structured to give you cohesive and comparable information about students and their thinking while you are challenging them through contextual situations. A structure for journal writing includes (1) mathematical content, (2) students' attitude or affect, and (3) processes.

Journal prompts give situations or questions to which students respond. Responses may include words, pictures or drawings, or symbols. Encourage students to support their ideas and to clearly explain what they mean. They can give specific examples as part of their explanations.

Content prompts relate or connect topics within and outside of mathematics, targeting important or meaningful concepts and skills. They can also provide situations that focus on areas where students often have misunderstandings or misconceptions. The responses to the prompts give teachers (and students) insight into how a student has interpreted a mathematical idea.

Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. Students' responses allow you to assess how positive attitudes about mathematics and mathematicians are developing in the classroom environment.

Finally, being aware of how one solves or approaches problems is promoted by **process prompts.** The responses to these prompts can give insight into students' preferences for problem-solving strategies and into how they learn or remember. As students become aware of how they learn and solve problems, they grow stronger in confidence.

Introduction: Grades 3–4

Description of materials

There are at least 100 prompts to choose from. Some of them may be used more than once to ascertain how students are growing in their understandings of and beliefs about mathematics. The prompts may also be used as assessment tasks for expanded response or self-constructed response items.

Each mathematical content prompt includes a short description of what you might expect or consider in students' responses. The mathematical content responses should reflect a student's progress in understanding the concept or skill.

The content prompts were selected to match recommendations from the National Council of Teachers of Mathematics (*Principles and Standards for School Mathematics*, 2000) rather than to fit a specific text. Locate the topic that you are studying and then select the prompt that best fits the class. You may change the wording if students will not understand the terminology or vocabulary used.

Affective or attitudinal prompt responses show students' beliefs. If you use them more than once, you should be able to detect changes in beliefs or feelings about mathematics as a discipline as the year or semester progresses.

Process prompts give students an opportunity to show how they do a mathematical process or algorithm (step-by-step procedure). When you use these prompts, you gain insight into how students have interpreted or altered procedures.

You can use writing prompts daily or intermittently, depending on your class, and you can repeat them from time to time. In prompts that use students' names, feel free to change the names to represent your students. If you use journal prompts daily, it is recommended that students respond to three content prompts, one process prompt, and one attitudinal prompt in a week.

Evaluating students' responses

When we tested journal writing in classes, we found that students tend to give the writing more thought if it is to be scored. One method our writing team used was to score the responses on content rather than on grammar and spelling. We used an essay grading method, reading two or three papers to get a feel for students' responses. These first papers formed the baseline for scoring other papers.

We designed this rubric for scoring journal responses.

4 points: The student's work includes—
- a completed prompt or an answer to the question posed.
- support for statements made by using either examples or counterexamples.
- ideas clearly communicated to the reader.
- legible writing, drawings, pictures, charts or tables, and diagrams.
- accurate mathematics or information.

3 points: Omission of one criterion from level 4.

2 points: Omission of two criteria from level 4.

1 point: Omission of three criteria from level 4.

0 points: Omission of more than three criteria from level 4.

There are many ways to create a rubric. Teachers alone can develop a rubric or students can work with the teacher to develop a rubric specific to their class. Here are two sample rubrics that have been developed with students' participation.

A five-level scale:

4 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

3 **The student's work shows a response that—**
addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- does not have fully justified or supported statements.
- makes sense to the reader.

2 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has some incorrect or inaccurate mathematics.
- is legible.
- does not have justified or supported statements.
- is somewhat clear to the reader.

1 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is partially legible.
- does not have justified or supported statements.
- does not make sense to the reader.

0 **The student's work shows a response that—**
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not make sense to the reader.

A three-point scale:

Exceeds standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

Meets standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has some correct or accurate mathematics.
- is legible.
- does not support or justify some of the statements made.
- makes sense to the reader.

Below standard The student's work shows a response that—
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not support or justify statements made.

Although grammar and punctuation are not usually scored, students should communicate their ideas in ways that are understandable. Some students may use drawings, tables, charts, or other means to convey their ideas. Encourage them to use whatever way they need to make their ideas clear.

After the first writing assignment, you can take excerpts from students' papers to illustrate qualities that you consider important. Show comparisons between high- and low-quality responses by putting them on overhead transparencies or photocopying them for all students. Keep the responses anonymous.

Content Prompts: Grades 3–4

You can present the prompt to the whole class and have students share ideas. You can record their ideas on big chart paper or on the board. The chart paper provides a permanent record that can be revisited later in the year to check the progress of students' understanding of or thinking about mathematical concepts or skills. At that time, you can revise students' comments or add new ideas.

If your mathematics program involves parents, you can assign the prompts as homework. The parents can record any textual information the student shares.

You can also use the prompts in a problem-solving context where students create a solution in a group or individually. If groups work on the problems, they can share their ideas before the whole class. If they work individually, you will need to find some way to provide for a sharing of ideas. Either way, their ideas should be recorded for future reference.

I. Number and Operations

1. **I use numbers every day to . . .**

   Answers will vary. Students should discuss numbers that occur in their everyday life. The situations may be related to purchasing items, sharing with family members, or counting. Have students share their writings to illustrate how mathematics can be found in contexts outside of school.

2. **Kenya rounded a number to 800. Find a number that Kenya could have used. Explain why it could be rounded to 800. Find at least two more numbers that could be rounded to 800.**

   Some students may round from the tens position and others from the hundreds position. Students may give numbers that involve fractions or decimals. For example, 790 and 803 could both be rounded to 800 reasonably. So could 800.7 or $775\frac{1}{2}$*. There are multiple solutions.*

3. **A number line can be used to . . .**

   Responses will indicate different uses of number lines. Watch for appropriate use as models for operations. Use students' comments as part of a class discussion on operations. Some students may comment on using a number line for measurement.

4. **Aaron asked, "Are decimals the same thing as whole numbers?" "What are whole numbers?" asked Maria. How would you respond to Maria's question?**

   Responses should include a description of whole numbers. Students may list the numbers or describe them in words.

5. **Write a letter to a friend in the third grade about the largest number you have ever used. Describe how you used the number.**

   Answers will vary. Responses will give you an indication of each student's development of the concept of large numbers.

6. **Serena asked her teacher why we need numbers larger than 10,000. What do you think her teacher said?**

   Answers will vary. Students may describe uses that could be discussed with the whole class. Check responses for appropriate uses of large numbers. For example, students may suggest that we need numbers larger than 10,000 to count the number of people who live in the United States.

7. **Amy wrote, "$3 \times 2 = 5 + 1$." Larry asked, "What does the '=' mean?" What should Amy tell Larry?**

   Responses should indicate that both 3×2 and $5 + 1$ represent the same amount. Encourage students to generalize or make statements about the use of equal signs to show equivalent amounts.

8. **Draw a picture that would convince a fifth-grader that 78 < 112.**

   Answers will vary. Some students use pictorial representations of base-ten blocks while others may explain the relationship in words.

9. **Darrell made a chart to show equivalent fractions. He wrote, $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \ldots$ Draw pictures or write a description that would explain why Darrell is correct.**

   Students' descriptions can be used to stimulate class discussion. You can distribute students' responses and ask other students to verify their correctness.

10. **Genna said, "I have a favorite fraction. I use it every day." Give your favorite fraction and use it in a problem or story.**

    Answers will vary. Watch students' responses for appropriate use of the fraction or an appropriate context for the fraction.

11. **How often do you use fractions or decimals? Make a list of the times you used them in one day.**

    Answers will vary. When you assign this prompt, you can give students additional time to respond so they can create a log of the uses of rational numbers. Those contexts they describe can be used as a basis for concept or operation development.

12. **"I have counted all my money," said Steven. "I have seven quarters, nine dimes, eight nickels, and 12 pennies." How can Steven trade his money so that he has the least number of bills and coins? Explain your answer.**

    Steven can trade his money into three one-dollar bills, one dime, one nickel, and two pennies. He has $3.17 total. Students should show the process they used to arrive at their answer. Many ways are possible such as adding up all amounts first and then finding the bills and coins needed. Or students may "trade as they go," showing how the trades are done.

13. **Mr. I. M. Money has decided to give $1,000.00 to a student who can spend it wisely. Write a letter to Mr. Money and explain how you would spend the money. Be sure to explain why you would spend it that way.**

    Answers will vary. Make sure that responses are reasonable. This activity can be expanded to language arts class.

14. **Write a word problem that can be solved by 153 ÷ 3 = 51.**

    Answers will vary. Be sure to check the problem to determine if division is the correct operation. Other numbers or operations can be substituted in this prompt.

15. **Amanda solved a division problem.**

    79 ÷ 24 = 3*R*7

    Tino asked, "What does the remainder 7 mean?" What do you think she told him?

    Students may indicate that 7 represents the amount left over when you group the 79 into groups of 24. Or they may indicate that it is the amount left over when you put 79 into 24 groups.

16. **Write a word problem that can be solved by multiplying two numbers. Show the solution.**

    Students should write a problem that can be solved by multiplying. Be sure to check that multiplication is the appropriate operation.

17. **Addition, subtraction, multiplication, and division problems can be written in horizontal (across) or vertical (up and down) forms. My favorite way to write and then solve these problems is . . .**

If students have not been accustomed to these words to describe the forms, you may have to give an example of each form. They should explain their response or demonstrate how it works. This prompt is also a process prompt.

18. Darron's calculator is broken. It doesn't always add correctly. He has difficulty deciding if a problem is done correctly. He added 43 + 201 + 605 + 113. His calculator showed a sum of 692. Do you agree? Why or why not?

Students should disagree because an estimate of the sum is closer to 900 to 1,000, Some students may show you how to solve the problem or they may use an estimation strategy such as front-end or compatible numbers. Others may note that one addend is 605 and another is over 100. Thus, the sum must be larger than 692.

19. Addition and multiplication are related because . . .

Answers will vary. Some students may comment on the repeated addition model of multiplication. Be sure they explain their answers.

20. Jennifer and Patrick were arguing about what a fraction is. Describe what a fraction is and give examples of fractions.

Answers will vary. It will be interesting to note how many students, if any, indicate that a whole number is also a fraction. Pay particular attention to how students represent a fraction. Some may use only continuous models while others will include discrete models.

21. Why do fractions have to have common denominators before they can be added?

Responses should indicate that you cannot identify the sum or the amount represented in a sum without having some common comparison such as a common denominator.

22. "I have a puzzle," said Ron. "Three is a factor of 6 and six is a multiple of 3." How can you explain what Ron said?

Students give a clear distinction between factors and multiples. Factors are the two numbers multiplied to get the product. Multiples are products using a specific number and multiplying it by 1, 2, 3, 4, and so on. For example, the multiples of 3 are 3, 6, 9, 12, 15, . . .

23. Carina wrote this problem: $\frac{1}{2} + \frac{7}{15} = ?$

Is the sum about 0, $\frac{1}{2}$, or 1? How did you decide?

Students usually comment on the relations of the numerators and denominators in estimating each fraction. They may show how they estimated. Watch for students who solve and then estimate (or round) the sum. Encourage students to demonstrate some method for estimating the size of fractions using 0, $\frac{1}{2}$, and 1 as benchmarks without doing the addition. The sum is close to 1 because $\frac{7}{15}$ is close to $\frac{1}{2}$. Then it is added to $\frac{1}{2}$ to give a sum close to 1.

24. Division is . . .

Answers will vary. Responses should describe one of the models for division such as repeated subtraction, grouping, or partitioning.

25. June asked her teacher, "Can a fraction have a numerator that is larger than the denominator?" What do you think June's teacher said? Explain.

Responses should discuss improper fractions and possibly the definition of a fraction. Examples should be included in the response. Or students should include an explanation in words that will support their comments.

26. The numerator of the fraction tells me . . . The denominator of the fraction tells me . . .

Responses usually indicate something about part-to-whole relationships. Encourage both continuous and discrete models for fractions. If students use a continuous model, they may describe a whole that is cut into pieces, each piece the same size. If they use a discrete model, they may discuss a set of, say, blue and red blocks. The fraction could represent the number of blue blocks compared with the entire set.

27. Mariah's teacher said, "The answer is 24." What do you think the question was? Support your answer.

Answers will vary. Some students will respond with a computation answer while others may say that 24 is two dozen eggs. Accept and encourage all contexts. Responses could be displayed on a bulletin board so students can share the different ways they think of numbers. This prompt can be repeated using different numbers as the answer.

II. Algebra

1. Jon made a number pattern: 1, 4, 7, 10, . . . He said his rule was to add 3 each time. Make a different number pattern. Describe your rule.

Answers will vary. Students' patterns should be consistent within the example they give. The rule should be clearly defined. These can be put on note cards and exchanged with other students.

2. Chad wrote, "4, 12, 20, . . ." Find three different ways to describe the number pattern. Support your pattern descriptions.

One way is to indicate that 8 is added to the previous term. Another way is to note that these are multiples of 4. A third way is to say that each term is 4 times an odd number (4 × 1, 4 × 3, 4 × 5, . . .). If the pattern can be verified, you should accept it.

3. Sean made a pattern with shapes.

Create a pattern that uses four shapes. Draw your pattern. Describe it in words.

Answers will vary. Students should have a consistent rule that they use to draw the pattern. Instead of drawing their pattern, students could use attribute or shape blocks to make the pattern and then describe it orally.

4. Patterns are useful (or not useful) in mathematics because . . .

Answers will vary. Encourage students to support their responses with specific examples.

5. Ralph shook his head. "I can't figure this out," he said. Help Ralph solve the problem.

What's the pattern?

$$4 \times 3 = 12$$
$$4 \times 4 = 16$$
$$4 \times 5 = 20$$

Students may comment on any pattern they find. Typical patterns include that increasing one factor by 1 causes the product to increase by 4. Or the multiples of four are the same numbers you get when you skip-count by fours.

6. **Blythe was eating a gooey hot fudge sundae last night while she was doing her homework. She dripped some hot fudge on her homework paper. What goes under the blobs of hot fudge?**

Find at least four possible answers. Justify your answers.

Answers will vary. For example, 35 and 35, 40 and 30; $39\frac{1}{2}$ and $30\frac{1}{2}$, 50 and 20.

7. **Jess wrote, "(14 – 8) – 4." James asked, "Is that the same as 14 – (8 – 4)?" What would you tell James? Explain.**

Subtraction is not associative. Students should tell James that it is not the same and support their answer. This prompt can be given to the whole class to begin a discussion of the associative property.

8. **Write a word problem that can be solved with the number sentence**

$$16 + 29 = 45.$$

Answers will vary. Students can check each other's problems. Be sure that the problems students pose can be solved with this number sentence.

9. **Describe a time when you have *overestimated*. Why did you need to overestimate?**

Answers will vary. Students should describe contexts that require overestimation such as at the grocery store to allow for the amount of tax.

10. Draw a picture that shows why 5 + 7 = 7 + 5.

Students should use the model of joining sets and then looking at the total number of items in this combined set.

11. In addition, 1 + 5 gives the same sum as 5 + 1. Is this true for subtraction? Why or why not?

No, it is not true for subtraction. The difference or answer to a subtraction problem is not the same when the order is reversed.

12. In multiplication, 3×2 gives the same product as 2×3. Is this true for division? Why or why not?

No, it is not true for division. The quotient is not the same when the order of the numbers is reversed.

13. When I read a word problem, I know I should use addition to solve it if . . .

If you notice students focusing on keywords such as altogether, *create some problems that use* altogether *in the context but are not solved by addition.*

14. O + D = D + O

Find at least four values for O and D that make the equality a true sentence. What do you notice

Any numbers students use will be appropriate. What they should notice is that changing the order does not change the sum. The equality represents the Commutative Property of Real Numbers.

15. Find two numbers whose difference is 6. Find four more pairs. What do you notice about the pairs?

For example, 10 and 4, 12 and 6, 6 and 0, $6\frac{1}{2}$ and $\frac{1}{2}$. Their observations will vary.

16. **Write a problem that can be solved by $9 + x = 17$.**

    As with other prompts of this type, the responses can be written on note cards and exchanged in class the next day. Or students can share them in a group and select the "best" one to share with the class.

17. **Write a short story that uses _____ in it. (Note: Insert any number or symbol in the blank.)**

    Answers will vary. Their stories can be used in a language arts activity and displayed on a bulletin board. You can add a seasonal flavor by having the story relate to a particular event.

18. **My favorite number is _____. Write a number sentence using that number. Why is this your favorite number?**

    Answers will vary. The number sentence should consist of only numbers and show accurate mathematics.

III. Measurement

1. **Rainzina asked Angela to measure her height. What tool do you think Angela will use to do the measurement? Why?**

   Students should give a reason for selecting a specific measuring tool. Responses should include an appropriate tool such as a yard-stick, meter stick, or tape measure.

2. **Courtney said, "I can draw an angle that measures less than 90°." What would Courtney's angle look like? Draw her angle and describe how you know it will measure less than 90°.**

   Answers will vary. Responses should include a picture and an explanation that describes how a student knew it would be less than 90°.

3. **What is area? Describe and show examples.**

   Responses should include more than a formula. There should not be an emphasis on quadrilaterals (specifically squares or rectangles) if students have had experience with other shapes. Area refers only to two-dimensional shapes.

4. **What is perimeter? Describe and show examples.**

   Responses should include more than a formula. There should not be an emphasis on quadrilaterals (specifically squares or rectangles) if students have had experience with other shapes. Perimeter refers only to two-dimensional shapes but it is related only to length.

5. **Write a letter to a sixth-grader describing the difference between perimeter and area.**

   Students should note that perimeter is the length around a shape and that area focuses on the region contained within the boundary of the shape. Students will use their own words to describe these differences. Responses should not focus only on rectangles or squares.

6. **"Do you ever see angles in your home?" asked Dan. "I have seen some," said Pat. What do you think Pat has seen?**

   Answers will vary. For example, some students will note that there are angles in doors, room corners, and floor tiles. To extend the prompt, ask students what types of angles they have seen in their homes.

7. **The first time I measured something was when . . .**

   Answers will vary. Have students share their experiences with measurement.

8. **Find as many rectangles as you can that have a perimeter of 36 units. Draw them, showing their dimensions. What do you notice?**

   Most students will show whole number dimensions. You can use their rectangles to discuss the relationships between area and perimeter. Students may notice that if the dimensions, length and width, are multiplied, the product is 36.

9. **Cherie said, "The perimeter of an octagon is always double the perimeter of a rectangle." "That's not always true," said Alexa. What do you think? Draw a picture(s) to support your ideas.**

   Students should give examples to show that it is not true. If it is a regular octagon and a square, both having sides of the same length, it will be doubled. Students may find other examples to show that it may be true under certain conditions, but it is not always true.

10. **Clandell said, "You can measure perimeter using centimeters." "No," said Candace. "Centimeters are used to measure area." What do you think? Explain.**

    Answers will vary. Responses may include explanations about linear measurements compared to two-dimensional measures.

11. **Marisa found a quadrilateral that had a perimeter of 15 centimeters. Draw at least four quadrilaterals that could have that perimeter.**

    Answers will vary. Examples can be related to ideas about concave and convex classifications of quadrilaterals.

12. **Write a story problem that involves measuring something.**

    This prompt can be tied into a language arts or social studies theme. Responses can be shared with the class.

IV. Geometry

1. **An example of intersecting lines that I have seen is . . .**

   Students may draw or describe their example. Have students share their examples in class. To extend the prompt, ask students to make a generalization about intersecting lines.

2. **Lani said, "A triangular prism has two faces that are shaped like triangles." "No, it doesn't," said Laura. "A triangular prism has three faces that are rectangles." What do you think? Support your answer.**

   Both Lani and Laura are correct. Students usually draw a triangular prism to support their answer. A triangular prism has two triangles as the bases and rectangles as the lateral faces.

3. **A quadrilateral and a square are (not) related because . . .**

   A square is a special quadrilateral. Students may also list other properties such as that they both have four sides and four angles.

4. **Pam thought that a rectangle and a square are the same thing. Is she right? Prove it.**

   Students may comment on like qualities such as congruent sides. However, a rectangle may not have sides of equal lengths. A square is a special case of a rectangle.

5. **The shape I have seen that has at least one line of symmetry is _____ because . . .**

   Answers will vary. Check responses for lines of symmetry. Are there any generalizations that students can make about all of the shapes?

6. **Draw any two shapes. How many different ways can you put the shapes together to make a new shape? Draw the new shapes.**

   Answers will vary. This is an interesting prompt to discuss in class. You can ask students to see if they notice any similarities between the original shapes and the ones they created. Classify them using various schemes such as the number of sides or the number of angles.

7. **Using a geoboard or geoboard dot paper, construct a figure that has three right angles. Find another shape with three right angles. What do you notice about the shapes? Support your answer.**

   This prompt can be done without a geoboard, but a geoboard provides a means to explore these shapes. You can substitute three right angles with a shape with as many right angles as possible, exactly two right angles, no right angles, seven sides, and so on. With the prompt given, students may find that there are many shapes they can make with three right angles. A trapezoid is one example.

8. **I think the diameter of a circle and its center are (not) related because . . .**

   Students should notice that a diameter passes through the center of the circle. They may also say they are unrelated because one is a point and the other is a line segment.

9. **A right angle is . . .**

   Responses may show how students visualize a right angle or whether they are more definition-oriented. You can substitute an acute or obtuse angle for the right angle.

10. I can tell the difference between a 45° angle and a 90° angle because . . .

Students may sketch examples or discuss how the angles appear different visually. Some responses may mention the differences between acute and right angles in a general sense.

11. I see geometry at home when . . .

Answers will vary. Responses can be shared with the whole class. The contexts that students mention in their responses can be used to discuss other geometric concepts.

12. Randy wants to build a cylinder. Explain to Randy what shapes he will need. Describe how he should build it.

Randy needs two circles and a rectangle. Students can trade papers and try to construct a cylinder by using another student's directions.

13. I think the term *diagonal* means . . . Support your answer with drawings that show diagonals.

Encourage students to use their own ideas and drawings to respond.

14. Holly wondered, "Do all shapes have diagonals?" What would you tell Holly?

Circles do not have diagonals, nor do triangles. Encourage students to explore patterns found with the type of shape and the number of diagonals.

V. Data Analysis and Probability

1. **Probability means I will study . . .**

   Responses may include descriptions of contexts in which probability concepts or skills are used.

2. **Faby said, "It is unlikely that I will get to have a party." What does *unlikely* mean? Explain.**

   Responses should indicate that Faby's chances of having a party are low.

3. **Mikel likes to make a bar graph. What kind of graph do you like to make? Why?**

   You may want students to explain what a bar graph shows.

4. **"The probability is 3/4 that I will draw a blue block out of the bag," said Elise. Does that mean there are no red blocks in the bag? What do you think? Explain your thinking.**

   Answers will vary. Some students will say you cannot tell how many red blocks there are in the bag. But you know that there are a lot of blue blocks compared to the number of other colored blocks. To extend this prompt, ask students to tell you what could be in the bag. Test the students' suggestions.

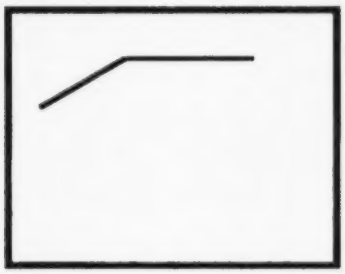
5. **An event that is *impossible* means . . . Explain.**

   Students should describe an impossible event such as a rainfall of elephants. You can substitute certain *or* likely *for* impossible.

6. **Katlin said, "If I flip a coin, I have an equal chance to get a tail or a head." "No, you have a one out of two chance to get a tail," said Brian. Who do you agree with? Why?**

   Either student's opinion can be justified. Katlin's description is the same as Brian's description. Flipping a coin is an example of independent events.

7. **Complete the graph with a title, and label the axes. Then write a story about what the graph says.**



Answers will vary.

Affective/Attitudinal Prompts: Grades 3–4

1. **When I do math, I feel _____ because . . .**

2. **Write a letter to your best friend describing your favorite part of math class.**

3. **Draw a picture of a mathematician or someone you know who uses math in a typical workday. Describe that person's work.**

4. **What does someone who likes math do for fun?**

5. **I think a scientist likes (or dislikes) math because . . .**

6. **I will probably (or probably not) like math classes when I get older because . . .**

7. **Pick a story or a song that shows how you feel about math. Describe why it shows your feelings.**

8. **If I could change one thing about our math class, it would be to . . .**

9. **A person who uses a lot of math is _____ because . . .**

10. **To me, math means . . .**

11. **Using group work in math makes me feel . . .**

12. **Arithmetic is . . .**

13. **Problem solving is . . .**

14. Geometry is . . .

15. My favorite thing we did in math this year was when . . .

16. My math class last year was the same as (or different from) this year's math class because . . .

17. My parents or other family member did (or did not) like math because . . .

18. To do better in math, I need to . . .

19. If I had to solve a math problem that uses big numbers, I would (not) use a calculator because . . .

20. Computers are (not) to be used to do math because . . .

21. Math is like . . .

22. The one tool that I use most to do math is the _____ because . . .

23. Draw a picture of a *perfect* math student. Describe why the student you drew is perfect.

24. I ask for help in math when . . .

25. If I wrote a math book, one of the things I would include in the book would be . . .

26. I like to share my ideas in math class because . . .

27. My favorite television character that uses math is _____ . Describe how that character uses math.

28. If math was a color, it would be _____ because . . .

Process Prompts: Grades 3–4

1. **Draw a picture of how you look when you are solving a problem.**

   You may want to follow up on responses. Students' comments can give you indications of their views of themselves as mathematics students.

2. **To study for a math test, I . . .**

   Responses can be used to discuss study skills or test-taking strategies.

3. **When I see a word problem, I first _____. Then I . . .**

   Strategies that students use to solve word problems can be used as a basis for class discussion. You may want to compare the process that students use to Polya's four steps of the problem-solving process.

4. **Explain to a second-grader how to estimate when using three-digit numbers.**

   Responses should include a reference to a cut-off number, such as if the number has a 5 or larger in the tens place, the number should be rounded to the next 100. Or another strategy for estimating may be used besides rounding. Responses could describe a compatible number, front-end, or cluster strategy.

5. **The problem-solving strategy I use the most is _____ because . . .**

   On the board or overhead, list the strategies that students share in their responses. Ask students if they use the strategies for any particular type of problem.

6. **Describe a problem that you would solve with a calculator. Why would you use a calculator?**

   Responses should describe specific problems. Compare responses to this prompt with responses from the following prompt.

7. **Describe a problem that you would solve with paper and pencil. How is it different from one you would solve with a calculator?**

   Compare responses to those described in the previous prompt. This may be an opportunity for you to lead a class discussion about selecting appropriate methods to solve a computation problem.

8. **Write a problem that you can solve in your head without a calculator or paper and pencil. What is the most difficult problem you can solve in your head? Why?**

   Use the responses as in the previous prompt. Have students categorize problem types that are best solved with paper-and-pencil methods, calculators, and mental computation.

9. **When I estimate the length of something, I . . .**

   Responses should include a description of the process students use to estimate length.

10. **I understand geometry better when I . . .**

    Responses can you give you an indication of instructional techniques that may support learning.

11. **Learning arithmetic is easier when I . . .**

    This prompt is used to help students identify techniques or strategies that help them learn.

12. Draw a picture of what you look like when you are in math class.

Responses give you an indication of students' views of their role in a math class or their affective response to mathematics.

13. Learning math is the same as/different from learning how to read because . . .

As students respond to this prompt, they are becoming aware of how reading and mathematics are alike and different.

14. The most important thing to learn about in math is . . .

Responses should give you an indication of topics, concepts, or skills that are important for students.

15. To help me understand arithmetic better, I would change my math book so that . . .

When responding to this prompt, students share information about what helps them learn mathematics.

16. When I need to round a number, I think . . .

If you have discussed specific strategies for rounding, you can change the prompt to "When I need to round a number using front-end, I think . . ."

17. I can justify my answer to a subtraction problem by . . .

Response should be a mathematically appropriate way to check or justify the difference of two numbers. One method is to use addition; another is to write a fact team.

18. Subtraction is related to _____ because . . .

This prompt can be changed to other operations. Responses should include mathematically appropriate relationships.

19. When I compare the size of two numbers, I think . . .

Responses may include reference to a number line or to place value issues.

20. The thing I understand the most in math is _____ because . . .

It will be interesting to compare students' performance in class with the items that they indicate they understand.

21. The thing I think I need more work on in math is _____ because . . .

Responses indicate areas in which students may need additional work or areas in which they are not comfortable.

22. Memorizing addition facts (or multiplication facts) is easy (or difficult) for me because . . .

Strategies that students list in their responses can be used in class discussion. For students who indicate that memorizing facts is difficult, they may have access to other strategies that will help them.

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